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ABSTRACT

The process of assessment in career and technical education (CTE) is changing significantly under the influence of forces such as emphasis on assessment for individual and program accountability; emphasis on the investigation of consequences of assessment; emergence of item response theory, which supports computer adaptive testing; and pressure for authentic assessment by critics of standardized testing. The use of technology for assessment is being increasingly stressed. Potential advantages of computerized assessment include rapid feedback, money savings, enhanced security, more curriculum time, and capability to track process-oriented variables. Potential disadvantages include costs of equipment, personnel, and training; increased marginalization of groups based on ethnic or socioeconomic status; and missed opportunities to implement authentic assessments. Examples of applications of technology to evaluation in CTE include test design, item creation, presentation, item scoring, and location (through use of the Internet). In moving toward computerized assessment, consequences should be considered in line with current evaluation and validation models. Especially for policy makers and administrators, implementation is an important aspect of computerized assessment. Technology can support the broad changes in assessment that are ongoing as a function of internal and external scrutiny, and both authentic as well as traditional assessment can benefit from technology. (Contains 24 references.) (KC)

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IN Brief
Fast Facts for Policy and Practice
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by James T. Austin and Robert A. Mahlman

Technology and Assessment

Educational technology has ranged from blackboards to audiovisual media, but computers, networks, and hypermedia comprise a new frontier. Technology applies in principle to curriculum, instruction, and assessment. Within this matrix, technology is a springboard from which career-technical assessment can leap into the future. We discuss the evolution of assessment and then present computerized assessments and simulations. We conclude with implementation issues for career-technical education (CTE), including access by multiple populations.

Assessment Is Evolving

Assessment is changing significantly under the influence of forces that are social (National Research Council 1999) and technical (Hambleton 1996). Major forces include—

- Assessment for individual and program accountability, often high-stakes in nature
- An emphasis on the investigation of consequences of assessment in the revised ***Standards for Educational and Psychological Testing*** (AERA, APA, NCME 1999).
- Emergence of item response theory (IRT), which supports computer adaptive testing (CAT) and creates "new rules" of measurement (Wainer 2000).
- Pressure for authentic assessment by critics of standardized testing (Kohn 2000; Wiggins 1993)

Wiggins (1993) asserts that appropriate assessments are valid, authentic, and contextual. He argues that context is crucial for test designers because competence is situational and its essence is analysis of the situation and its shifts. His profile aids in developing assessments that are authentic and suggests roles for technology in assessment. A hypothetical example is a simulation for automotive technicians that begins with a customer complaint and proceeds through diagnosis, repair, and testing. In this example, instruction and testing can be fused seamlessly, as done in embedded assessment systems for science education (Wilson and Sloane 2000).

Technology Applications

In general, discussions of technology originate outside of CTE, and discussions of assessment and instruction are often separated. Bunderson, Inouye, and Olsen (1989) identified four generations: computerized testing (CT), computer adaptive testing (CAT), continuous measurement (CM), and intelligent measurement (IM). CT is the computer as a page-turner and scorer; CAT adjusts items to the test-taker; CM embeds assessments into ongoing learning; and IM adds expert knowledge that enhances testing and interpretation. Assessment via computer can be centralized or distributed over a network. What are the pros and cons?

Potential advantages of computerized assessment are—

- rapidity of feedback provided to learners and to teachers,
- monetary savings over time due to reduction in printing and shipping costs,
- enhanced security of summative high-stakes assessments,
- more curriculum time because of time savings in assessment,
- capability to track process-oriented variables (time, sequence).

Potential disadvantages include—

- costs including equipment upgrading, personnel, and professional development,
- increased marginalization of groups based on demographic or socioeconomic status, [e.g., the "digital dilemma" (Van Dusen 2000)],
- missed opportunities to implement authentic assessments meaningfully.

For Bennett (1999), technology influences assessment in many ways. Although he did not emphasize CTE, examples of applications include—

- *Test design.* A system, Portal, that employs "models" of student, evidence, and task to organize the domain. Application could be accomplished by ensuring that these three types of models reflect CTE students, national skill standards, and realistic entry-level tasks.
- *Item creation.* A Mathematics Test Creation Assistant program generates items for human review based on specification of a few variables. Application to CTE might consist of providing additional context that is specific to the 16 Department of Education career clusters.
- *Presentation.* Simulations that "game" jobs or parts of jobs. Consider the Interactive Patient developed at Marshall University as a case management exercise. In CTE this simulation could be adapted to diversified health occupations (or others) that feature interactions aimed at diagnosis, or the WonderTech toy factory could be used.
- *Item scoring.* Here the focus is on scoring constructed rather than chosen responses (essays instead of the multiple choices of traditional tests). Application to CTE could include responses involved in general entrepreneurship aspects of any occupation-specific training (e.g., market analysis, site selection, business plan preparation).
- *Location.* An analogy is made between distance learning (instruction) and Internet testing (assessment). For CTE, this analogy suggests the power of distributing assessment (and instruction) via Internet.

The Office of Technology Assessment (1994) study of vocational education testing reviewed assessments of four skill sets (academic, vocational, generic workplace, and broad technical), and several vendors (e.g., NOCTI, ACT, V-TECS). Two conclusions from the report were that performance assessments were more common in CTE and that broad technical skills were not being assessed well. Technology could assist in maintaining the former finding and addressing the latter problem.

Internet testing for CTE has been investigated in two studies, both using the computer as a "page-turner" (computer presents and scores the test). Kapes et al. (1998) tested 360 students in Child Care and Auto Body Repair programs using both paper-pencil and Internet formats for comparison. No significant differences in test scores were observed across demographic and special needs groups. Attitude surveys indicated that students preferred Internet testing 3 to 1. The Internet was a cost-ef-

fective and feasible alternative to traditional assessment, and test security was not compromised. Austin and Mahlman (2000) reported a small demonstration involving Administrative Office Technology students. A 100-item multiple-choice test was administered via Internet to 125 students. A subset of these students had taken the test earlier in a paper-pencil format. The scores for Internet administration of that subgroup were significantly higher but exhibited similar variability and internal consistency reliability. Teachers and learners had positive reactions to the feedback provided by the assessment system. What these two studies indicate is that even a relatively primitive application, the computer as a page-turner and scorer rather than as adaptive administrator, was effective and was received well by stakeholders.

Another way that technology facilitates authentic assessment is simulation. Simulations are linkable, for example, to the SCANS foundation-competency framework. A major advantage that we foresee is linking instruction and assessment to achieve the integration urged by Sheppard (2000). Computer simulations have high front-end costs of development to ensure realism, but their operational costs should be low. The issue of integration of assessment into instruction remains.

Implementation Issues

In moving toward computerized assessment, consequences should be considered in line with current evaluation and validation models. In addition to technical issues, it is important to understand the effects on groups that have been marginalized in the past. Examples include gender, racial/ethnic, and disability status at the individual level, and district socioeconomic levels at the institutional level.

Especially for policy makers and administrators, implementation is an important aspect of computerized assessment. Presentation of advantages vs. disadvantages, as well as usable strategies, adds value to discussions of technology. In CTE, a system involving modularized Internet testing is being developed for Information Technology programs. Designed to generate reliable statewide accountability data, this system will allow instructors to register students to take assessment modules after completing instruction. Question Mark software supports multiple item formats that approach authentic assessment (although there is room for improvement). The system provides immediate feedback on module attainment and also tracks student progress to generate program-level performance data for state and local administrators.

For teachers, technology-aided assessment poses potential threats because of new knowledge requirements. It will be crucial for administrators to provide professional development, perhaps using distance learning, so that teachers feel comfortable about systems used for assessment. As an example, Waugh, Buell, and Levin (1999) developed the Technology Competencies Database to support integrated teaching and assessment. It stores student accomplishments linked to technology competencies, is accessible by both student and teacher via Internet, and supports student creation of portfolios based on self-submitted evidence.

Evaluation of technology-based assessment should continue. Cost-benefit analyses are helpful in evaluating this technology. Costs may be developmental (one time or maintenance/ongoing. Categories of benefits are those that accrue to student evaluation, program improvement, and accountability.

Technology can support the broad changes in assessment that are ongoing as a function of internal and external scrutiny. Authentic as well as traditional assessments benefit from technology. Although we noticed a far greater focus on curriculum in discussions of educational technology (Plomp and Ely 1996), there is a literature on technology-aided assessment. This literature should be better integrated with practice to ensure lasting benefits for CTE.

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Internet Resources

General

http://lrs.ed.uiuc.edu/wp/credibility/bib.html
http://bubl.ac.uk/link/e/educationaltechnologyresearch.htm
http://www.jtap.ac.uk/reports/htm/jtap-028-7.html
http://www.bookstoread.com/ET/et.htm

Assessment

http://www.webmcq.com
http://www.questionmark.com
http://caacentre.ac.uk/
http://www.nwoca-ohio.org

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